2011

Cooperative Agricultural Pest Survey Report

MONTANA Department of AGRICULTURE

Montana Department of Agriculture

Ron de Yong, Director

Agricultural Sciences Division

Greg Ames, Administrator

Pest Management Bureau

Bureau Chief, SPRO

Donna Rise

Pest Management Program Manager, SSC

Ian Foley

Nursery and Quarantine Specialist

Elizabeth Eiring

Entomologist

Cam Lay

Administrative Assistant

Breanna Caldwell

PMB Survey Interns

Lindsey Aull and Robert Wiltzen

Commodity Services Bureau

Bureau Chief

Andy Gray

Agricultural Specialists

Bob Bales, Dawn Bales, Velda Baltrusch, Robyn Cassell, Chris Herron, Sean Mulla, Dan Poff, Ryan Solberg, Lori Vance

Produce Specialist

Larry Krum

Noxious Weeds Section PMB

Dave Burch, Craig McClane, Carol Bearden, Kim Johnson, Jeremy Seidlitz

Cooperators

USDA APHIS Plant Protection and Quarantine

USDA Forest Services

Montana State University Extension

Montana Department of Natural Resources and Conservation

US Department of the Interior

This report was compiled by Ian Foley, Cam Lay and Beth Eiring with contributions from our survey interns. Questions or comments can be addressed to the Montana Department of Agriculture Pest Management Bureau at 302 North Robert, Helena, Montana, 59601, or by phone at 406-444-9430, or e-mail at agr@mt.gov.

Table of Contents

Introduction to the Program

The Cooperative Agricultural Pest Survey (CAPS) is a nationwide survey effort initiated by the USDA Animal Plant Health Inspection Service (APHIS) Plant Protection and Quarantine (PPQ), to detect and/or monitor the spread of introduced plant pests. To achieve this goal, the USDA APHIS PPQ enlists the assistance of state cooperators. In Montana, state cooperators are coordinated through the Montana Department of Agriculture (MDA), and include not only the Department of Agriculture, but also Montana State University, the Montana Department of Natural Resources and Conservation, US-Forest Service, and others.

The Interns and Other Program Assistants

The Montana Department of Agriculture conducts several of the surveys. This would not be possible without the assistance of a group of dedicated people, who join the department for the summer as interns and survey technicians. We also had the invaluable assistance of Montana USDA-APHIS-PPQ and Amy Gannon, Forest Entomologist with DNRC. In addition, several MDA Agricultural Specialists, led by Velda Baltrusch of Great Falls, assisted in gathering Karnal bunt samples.

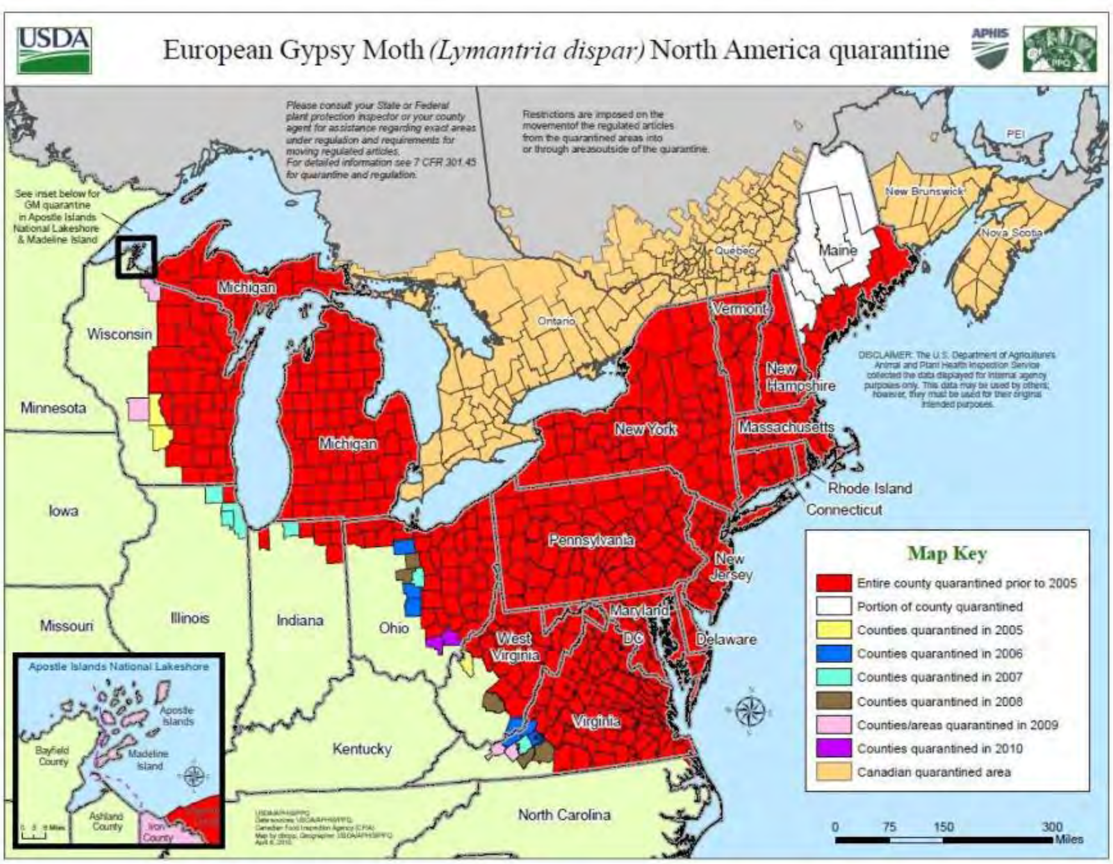
Interns for 2011 included Robert Wiltzen and Lindsey Aull. Robert Wiltzen is a Missoula native, veteran, and student at the University of Montana. Lindsey is a University of Montana student and organic farmer. Both displayed an exceptional work ethic and organizational skills; the program could not have gone forward without their assistance.

Gypsy Moth (GM) Detection Survey

Lymantria dispar (L.)

The European strain of the gypsy moth (*Lymantria dispar* (L.)) was initially introduced into the Eastern U.S. in the mid-1800s. It established rapidly and became a serious defoliating pest. Over 500 susceptible host plants have been identified. Most are deciduous trees and shrubs, but older gypsy moth larvae will also consume pines and spruces. In Montana, aspen and western larch are particularly important potential native tree hosts of the gypsy moth, especially in the western half of the state. Most landscape plants, urban trees and shrubs throughout the state would also be subject to GM defoliation.

Females of the European strain are flightless but crawl actively as they seek out oviposition sites. The egg masses are covered with scales or hairs, and have been found on Christmas trees, boats, RVs, outdoor furniture, RV's, firewood, and virtually any other object that might be left outdoors. They are thus readily transported to new areas by human activity. The gypsy moth is the most destructive forest pest in the Eastern United States and large areas of the Northeastern US are under a federal quarantine to prevent the spread of this pest.



http://www.aphis.usda.gov/plant_health/plant_pest_info/gypsy_moth/downloads/gypmoth.pdf

There have been several positive GM traps in Montana counties in recent years: Cascade (1989, 1990), Gallatin (1988), Glacier (2001, 2003, 2007, and 2008), Lewis and Clark (1988), Lincoln (2009), Liberty (1992), Missoula (1996), Park (2001), and Yellowstone (1993 and 2011). Given the distance between Montana and the quarantined portions of the US and eastern Canada, it is certain that these introductions were the result of human activity, specifically the movement of egg masses and pupae on contaminated vehicles and equipment. (This is the typical pathway by which gypsy moths spread into new areas.)

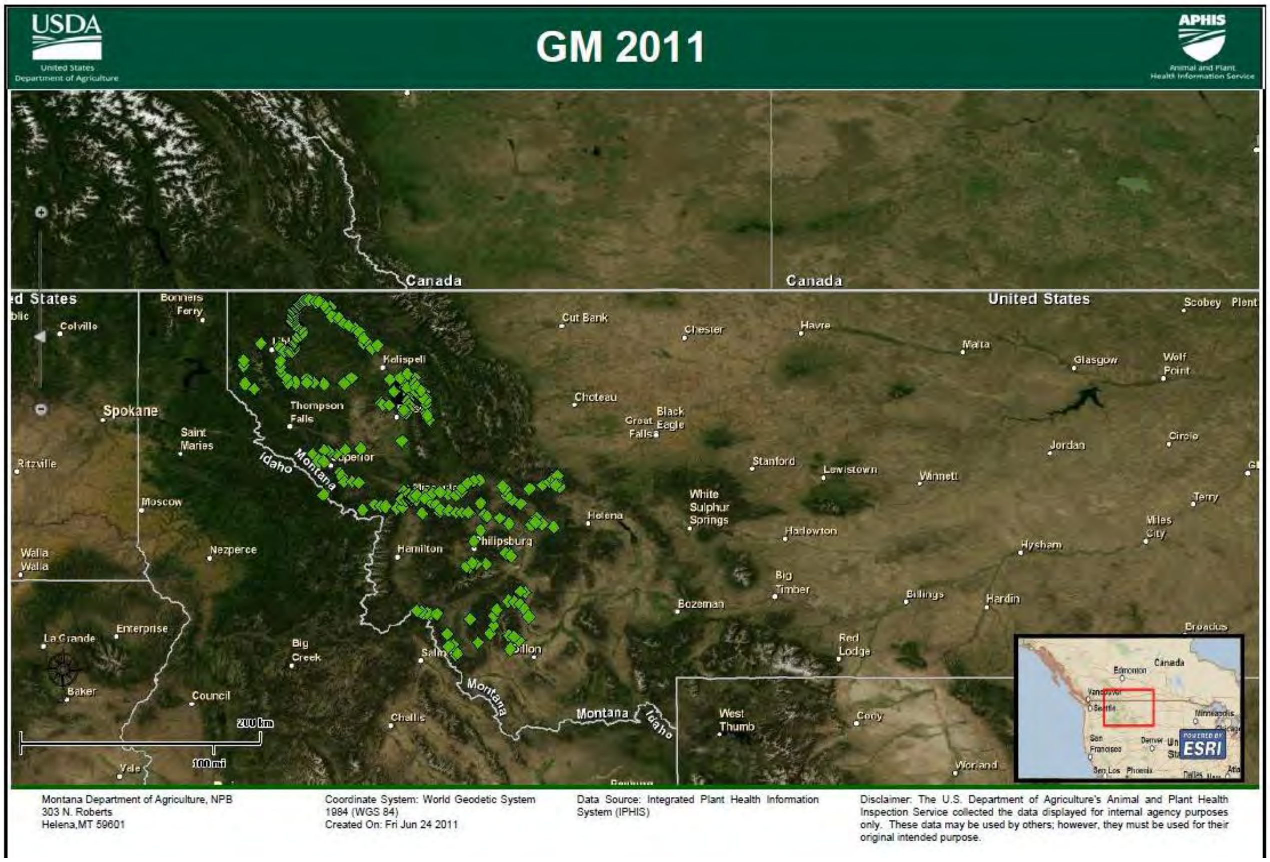
Male Gypsy Moth. Traps are baited with a female sex-pheromone lures and only attract males.

Gypsy moth caterpillar

In Montana, responsibility for the trapping of gypsy moth is a multi-agency cooperative effort between the USDA APHIS PPQ, the Montana Department of Agriculture (MDA), the Montana Department of Natural Resources & Conservation (DNRC), and the USDA Forest Service (USDA FS). The USDA APHIS PPQ placed traps mainly in the eastern portion of the state, while the MDA trapped in the western part of the state. The DNRC put out traps in Mineral and Missoula Counties. The USDA-FS set traps in a large number of campgrounds and other public recreation areas. The Department of the Interior placed traps in Glacier and Yellowstone National Parks. All traps were placed by early June, and checked throughout the summer at two to three week intervals.

RESULTS: 258 Gypsy Moth traps were placed by MDA personnel in 2011, as shown below. One gypsy moth was collected in an APHIS PPQ trap in Billings in 2011. (Billings is in the southwest corner of the map, below. The PPQ trap is not indicated because it was not placed by MDA). Montana PPQ will be following up at this location with egg mass surveys and high density detection trapping in 2012.

MDA 2011 Gypsy Moth Trapping



Emerald Ash Borer (EAB) Detection Survey

Agrilus planipennis Fairmaire

The emerald ash borer (EAB) is an exotic wood-boring pest that attacks and kills ash trees (*Fraxinus* sp.). In the eastern United States it is a severe threat to ash trees in hardwood forest ecosystems and the urban landscape. While native ash in Montana and the Intermountain West is limited to riparian areas, green ash (due to its rapid growth, hardiness, and cold tolerance) has been planted in some Montana neighborhoods at densities approaching 100%.

Emerald Ash Borer

The emerald ash borer is native to Asia, but was introduced into the Eastern United States through international trade sometime in the 1990s, most likely in dunnage or solid wood packing materials. It was first discovered in southeastern Michigan in 2002. Since then EAB has been detected in Indiana, Illinois, Iowa, Maryland, New York, Tennessee, Michigan, Ohio, Pennsylvania, West Virginia, Wisconsin, Missouri, and Minnesota. EAB larvae consume the cambium layer of ash trees, preventing the flow of nutrients and water up and down the tree. The insect will attack and kill both healthy and stressed trees; the average time to mortality, even for a healthy tree, is only two to three years. It is estimated that EAB has killed 40 million ash trees in Michigan alone, with tens of millions more having been killed in other adjacent states.

The success of outreach efforts regarding EAB is indicated by the increasing number of inquiries we receive each year about this insect. Unfortunately, the increasing number of reports also suggests a general decline in the health of Montana's ash trees. Each report is investigated on a case by case basis. So far, EAB has not been found in Montana.

Emerald ash borer traps are hung in ash trees (*Fraxinus* sp.). The large purple trap is sticky on the outside and acts as a panel flight intercept trap. The trap is baited with a Manuka oil lure that mimics the volatile compounds released by a damaged ash tree (image on the right courtesy of entomology.wisc.edu).

The map below shows the national distribution of EAB as of October 2011. Since the 2010 CAPS report, the number of EAB detections has increased in previously-infested counties, and the insect also appears to be slowly expanding its range into the counties surrounding the isolated populations in TN, MD, NY, WI, and MN.

EAB trapping in Montana has focused on highways, campgrounds, and urban areas where the insect is most likely to be introduced.

RESULTS

Two hundred EAB traps were placed in Montana in 2011, by the Montana Department of Agriculture, USDA-PPQ, and Montana State University. No suspected EAB were captured in 2011. A similar number of traps will be placed in 2012. The 2012 traps will also be inspected for the exotic pest *Agrilus biguttatus* and the native *A. coxalis*. Both affect oaks; neither has a high probability of becoming established in Montana. Bur oak (*Quercus macrocarpa*), has been reported to naturally occur in extreme Southeastern Montana and some varieties of oak are planted as landscape ornamentals.

Karnal Bunt Detection Survey
Tilletia indica Mitra

Karnal Bunt (KB) is a fungal disease that affects wheat, durum wheat and triticale. The disease was discovered near Karnal, India in 1931, hence the name. KB was first detected in the United States in 1996, within the state of Arizona in durum wheat seed. Subsequently, the disease was found in portions of Southern California and Texas. The disease has never been detected in Montana field production. KB thrives in cool, moist temperatures as the wheat is starting to head out.

Karnal Bunt spores are windborne and can spread through the soil. Spores have the ability to survive within the soil for several years. Grain can also become contaminated by equipment. Therefore, controlling the transportation of contaminated seed is essential in preventing the spread to Montana production areas. In addition, early detection is essential if any type of control or eradication is to be attempted. Montana's participation in the annual karnal bunt survey is part of the early detection grid set out across the United States.

RESULTS: Montana continued to sample for KB during the 2011 harvest. A total of 152 samples were collected from 34 counties across Montana. The USDA Laboratory in Olney, Texas conducted the testing. All samples tested negative for the presence of KB. This sampling is critical for wheat growers in Montana. It confirms our wheat is free from KB, ensuring access to international export markets.

Credits: R. Duran, Washington State University
www.forestryimages.org **Bunted Wheat**

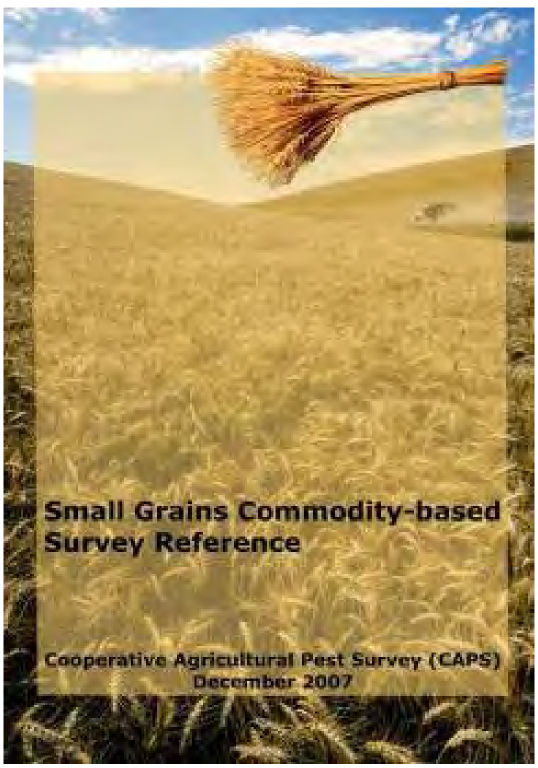
Wheat Production in Montana 2010 2011 Karnal Bunt Survey Numbers					
County	2010	2011 Samples	County	2010	2011 Samples
Beaverhead	683,000	0	McCone	7,629,000	5
Big Horn	5,541,000	4	Meagher	136,000	0
Blaine	7,968,000	5	Mineral	0	0
Broadwater	1,975,000	1	Missoula	75,500	0
Carbon	351,000	0	Musselshell	839,500	0
Carter	912,000	1	Park	311,000	0
Cascade	6,941,000	6	Petroleum	596,000	0
Choteau	24,223,000	23	Phillips	4,948,000	3
Custer	760,000	0	Pondera	9,141,000	7
Daniels	8,312,000	5	Powder River	420,000	0
Dawson	6,553,000	3	Powell	0	0
Deer Lodge	0	0	Prairie	342,000	1
Fallon	995,000	1	Ravalli	81,000	0
Fergus	7,777,000	7	Richland	6,451,000	4
Flathead	1,466,000	1	Roosevelt	10,970,000	8
Gallatin	3,209,000	3	Rosebud	2,177,000	1
Garfield	3,189,000	2	Sanders	-	0
Glacier	5,339,000	4	Sheridan	9,564,000	7
Golden Valley	909,000	1	Silver Bow	0	0
Granite	44,400	0	Stillwater	1,124,000	1
Hill	19,378,000	14	Sweet Grass	45,000	0
Jefferson	0	0	Teton	7,761,000	6
Judith Basin	3,238,500	3	Toole	8,610,000	6
Lake	982,000	1	Treasure	337,000	0
Lewis & Clark	614,000	0	Valley	9,592,000	7
Liberty	10,618,000	7	Wheatland	1,157,000	1
Lincoln	0	0	Wibaux	824,000	1
Madison	0	0	Yellowstone	3,532,000	2

http://www.nass.usda.gov/Statistics_by_State/Montana/Publications/croptoc.htm

Small Grains Commodity Based Survey (SG)

Detection Survey

The USDA published guidelines for a small grains commodity based survey in 2008. The idea behind commodity based surveys is to target export commodities rather than individual pests. When undertaking a commodity based survey, multiple survey methods are used to take samples from a single commodity or group of similar commodities over a longer time period. In the small grains survey, the Department used sweep net samples, visual surveys, soil samples for nematodes, insect traps, and whole plant samples for diseases. This methodology allows the survey to maximize the potential for pest detection and minimize the cost compared to several different surveys for individual pests.



The small grains survey targets 14 different types of exotic pests (see table 1 below) that could potentially damage small grains crops and negatively impact Montana exports. These pests include 8 arthropods, 2 mollusks, 3 nematodes, and 1 fungus like pathogen. In addition to the 14 exotic pests, samples were also screened for cereal leaf beetle and a number of other economically important nematodes and plant diseases.

Montana generally ranks in the top 5 nationally in the value of both wheat and barley crop production. Chouteau County, Montana is one of only two counties in the U. S. that produced over 20 million bushels of wheat in 2007.

Since the initiation of the Small Grains Commodity Based survey, two of the target pests have been detected in North America for the first time. The Cereal Cyst Nematode was detected in Oregon (Union County) in 2008 (Smiley et al. 2008) and the European Grapevine Moth was detected in California in 2009.

Table 1. List of target species of the USDA Small Grains Commodity Based Survey

Common Name	Species	Group
New Zealand Wheat Bug	*Nysius huttoni* White	Hemiptera: Lygaeidae
Old World Bollworm	*Helicoverpa armigera* Hübner	Lepidoptera: Noctuidae
Rice Cutworm	*Spodoptera litura* (F.)	Lepidoptera: Noctuidae
Egyptian Cotton Leafworm	*Spodoptera littoralis* (Boisduval)	Lepidoptera: Noctuidae
Owlet Moths	*Copitarsia* spp.	Lepidoptera: Noctuidae
Grape Berry Moth	*Lobesia botrana* (Denis & Schiffermuller)	Lepidoptera: Totricidae
Silver-Y Moth	*Autographa gamma* (L.)	Lepidoptera: Noctuidae
African Black Beetle	*Heteronychus arator* F.	Coleoptera: Scarabaeidae
British Root-Knot Nematode	*Meloidogyne artiellia* Franklin	Nematoda: Meloidogynidae
Mediterranean Cereal Cyst Nematode	*Heterodera latipons* Franklin	Nematoda: Heteroderidae
Cereal Cyst Nematode	*Heterodera filipjevi* (Madzhidov)	Nematoda: Heteroderidae
Conical Land Snails	*Cochlicella* spp.	Pulmonata: Helicidae
Maritime Garden Snail	*Cernuella virgata*	Pulmonata: Hygromiidae
Philippine Downy Mildew	*Peronosclerospora philippinensis*	Oomycete

New Zealand Wheat Bug

Results: During the 2011 survey, 50 sweep net/visual survey samples were submitted. No suspect target pests were detected in any of the samples. Economic levels of Wheat Stem Sawfly and Grasshoppers were found in a number of samples. Blister beetles populations (*Epicauta* sp.) were high in several samples and can be a pest in livestock feed, but no specific economic threshold have been established for Montana species.

The Montana State University Plant Pathology lab processed 50 small grain samples for plant diseases (see results table 2 below). The abbreviations in table 2: Triticum mosaic virus = TriMV, Wheat Streak mosaic virus =WSMV, Wheat mosaic virus (High Plains virus) = WMoV(HPV), Barley yellow dwarf disease = BYDV-PAV, and Cereal yellow dwarf disease = CYDV-RPV

Soil was analyzed for over thirty five nematode species, sixteen species of regulatory concern and nineteen other plant-parasitic genera, including: *Globodera rostochiensis, Globodera pallida, Ditylenchus destructor, Ditylenchus dipsaci, Meloidogyne chitwoodii, Meloidogyne*

fallax, Meloidogyne hapla, Meloidogyne javanica, Meloidogyne artiellia, Nacobbus abberans, Heterodera glycines, Heterodera latipons, Heterodera goettingiana and Pratylenchus sp.

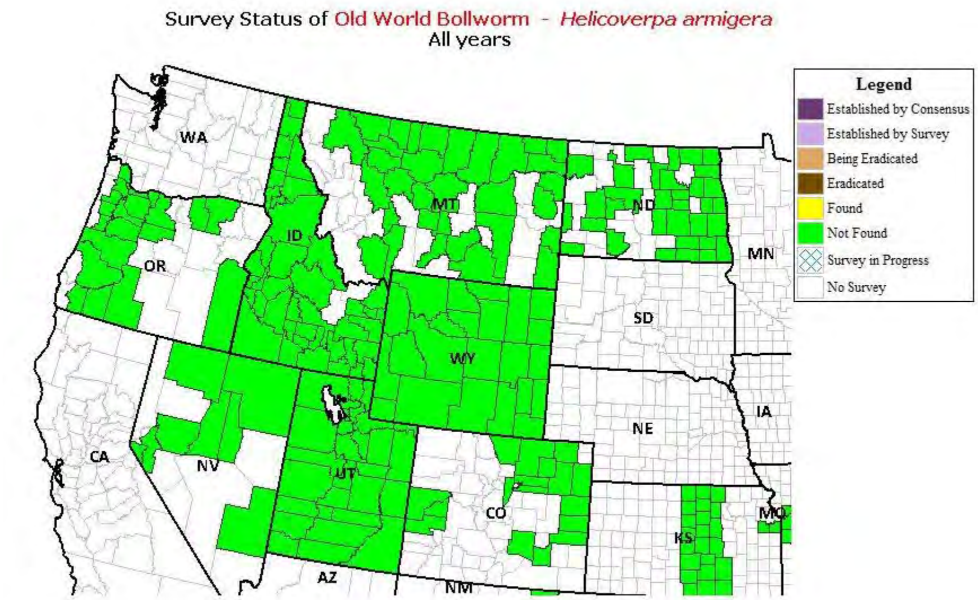
This information is important for Montana farmers in their management techniques and it also allows specific areas to be certified as free from some of these nematodes. This enables Montana producers to gain access to a wider agricultural export market for their crops.

2011 NEMATODE SURVEY RESULTS		
Species of Regulatory or Economic Concern	**Group**	**POSITIVE/NEGATIVE**
Bursaphelenchus xylophilus (Steiner and Buhrer)	Pine wilt	NEGATIVE
Ditylenchus destructor Thorne	Potato rot	NEGATIVE
Ditylenchus dipsaci (Kühn)	Bulb and stem	NEGATIVE
Globodera pallida (Stone)	Potato cyst	NEGATIVE
Globodera rostochiensis (Wollenweber)	Potato cyst	NEGATIVE
Heterodera glycines Ichinohe	Soybean cyst	NEGATIVE
Heterodera latipons Franklin	Cereal cyst	NEGATIVE
Meloidogyne arenaria (Neal)	Root knot	NEGATIVE
Meloidogyne artiellia Franklin	Root knot	NEGATIVE
Meloidogyne chitwoodi Golden et al.	Root knot	NEGATIVE
Meloidogyne fallax Karssen	Root knot	NEGATIVE
Meloidogyne hapla Chitwood	Root knot	NEGATIVE
Meloidogyne incognita (Kofoid & White)	Root knot	NEGATIVE
Meloidogyne javanica (Treub)	Root knot	NEGATIVE
Meloidogyne mayaguensis Rammah and Hirschmann	Root knot	NEGATIVE
Nacobbus aberrans (Thorne)	False root knot	NEGATIVE
Other Plant-Parasitic Genera	**Group**	**POSITIVE/NEGATIVE**
Anguina	Seed gall	NEGATIVE
Aphelenchoides	Bud and leaf	NEGATIVE
Belonolaimus	Sting	NEGATIVE
Cactodera	Cactus cyst	NEGATIVE
Ditylenchus other species	Other	NEGATIVE
Helicotylenchus	Spiral	POSITIVE
Heterodera other species	Cyst	NEGATIVE
Hemicycliophora	Sheath	NEGATIVE
Hoplolaimus	Lance	NEGATIVE
Longidorus	Needle	NEGATIVE
Mesocriconema	Ring	NEGATIVE
Paratrichodorus	Stubby root	NEGATIVE
Paratylenchus	Pin	POSITIVE
Pratylenchus	Root lesion	POSITIVE
Quinisulcius	Stunt	POSITIVE
Rotylenchulus	Reniform	NEGATIVE
Trichodorus	Stubby root	NEGATIVE
Tylenchorhynchus	Stunt	POSITIVE
Xiphinema	Dagger	POSITIVE

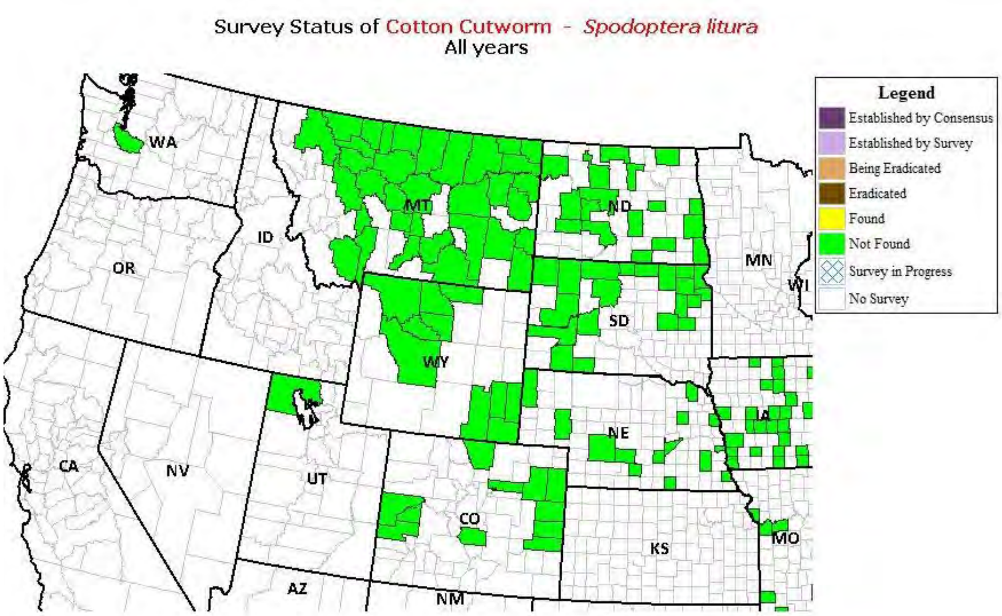
Soil samples for nematode detection analysis were sent to the University of Nebraska in Lincoln. Root lesion nematodes in the genus *Pratylenchus* were detected in several samples at

levels that are probably causing yield reduction. Typically, genera such as *Pratylenchus* and *Quinisulcius*, only are injurious to crops when numbers approach 500-1,000 individuals per 100 cc of soil. A complete list of nematodes detected in the samples is above.

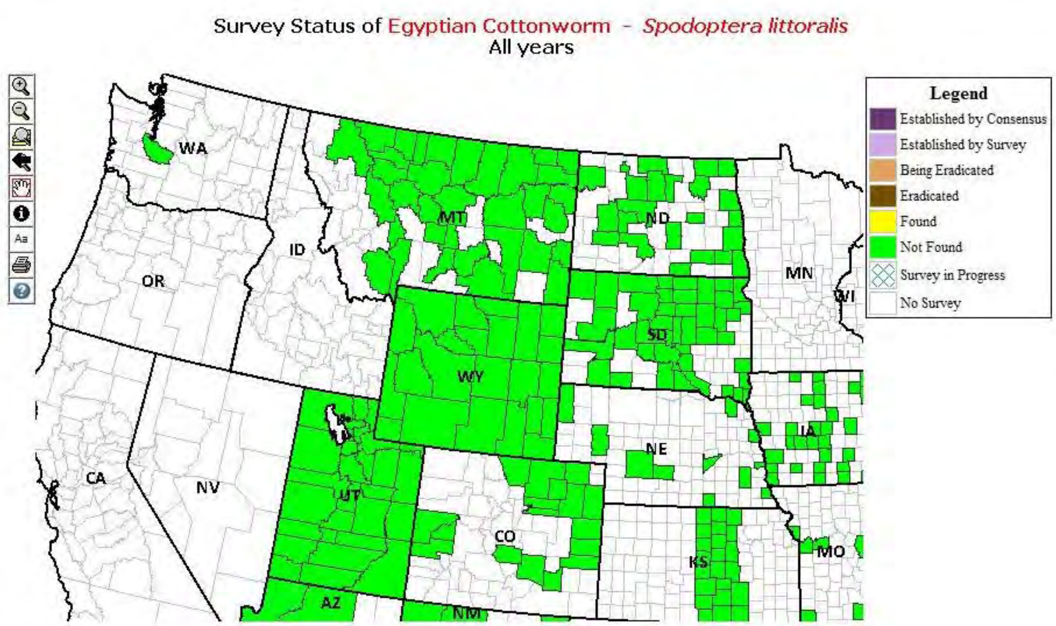
Survey Location for Small Grain Exotic Moths



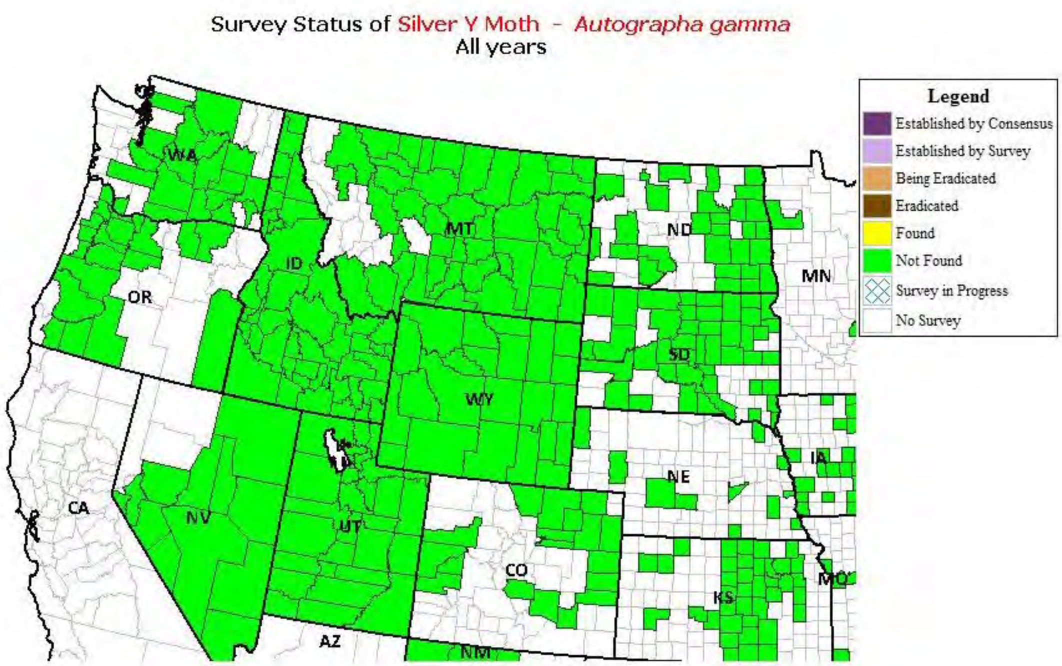
National Agricultural Pest Information System (NAPIS). Purdue University. "Survey Status of Old World Bollworm - *Helicoverpa armigera* (All years)." Published: 11/22/2011. http://pest.ceris.purdue.edu/map.php?code=ITBCFBA&year=alltime. Accessed: 11/22/2011.



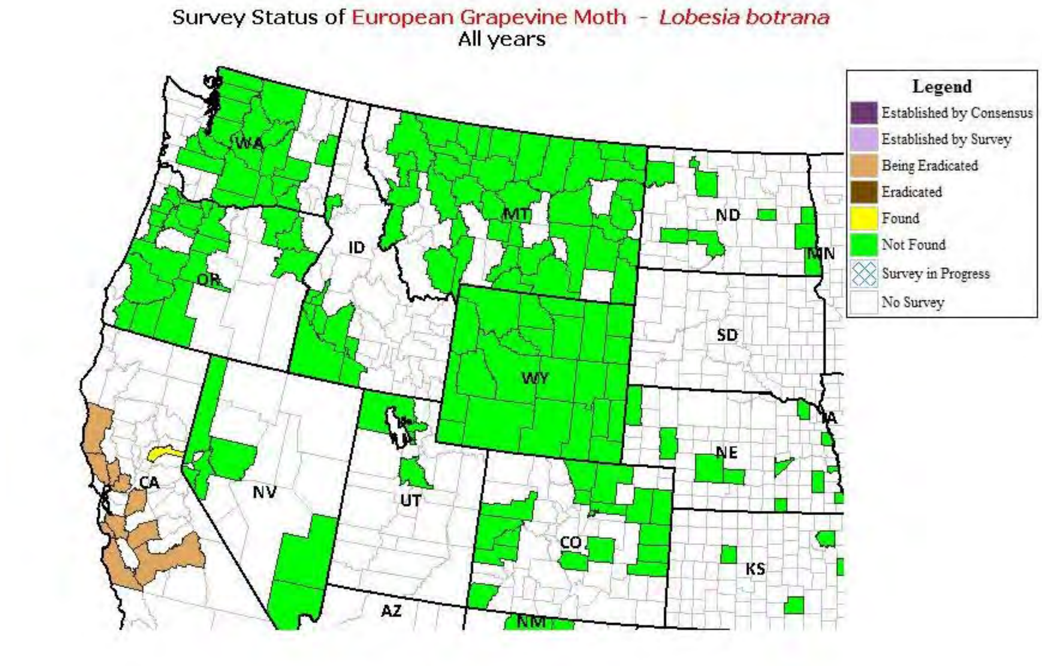
National Agricultural Pest Information System (NAPIS). Purdue University. "Survey Status of Cotton Cutworm - Spodoptera litura (2008 to present)." Published: 11/22/2011. http://pest.ceris.purdue.edu/map.php?code=ITBCFMA&year=3year. Accessed: 11/22/2011.



National Agricultural Pest Information System (NAPIS). Purdue University. "Survey Status of Egyptian Cottonworm - Spodoptera littoralis (2008 to present)." Published: 11/22/2011. http://pest.ceris.purdue.edu/map.php?code=ITBCFPA&year=3year. Accessed: 11/22/2011.



National Agricultural Pest Information System (NAPIS). Purdue University. "Survey Status of Silver Y Moth - Autographa gamma (2008 to present)." Published: 11/22/2011. http://pest.ceris.purdue.edu/map.php?code=ITBCFCA&year=3year. Accessed: 11/22/2011.



National Agricultural Pest Information System (NAPIS). Purdue University. "Survey Status of European Grapevine Moth - Lobesia botrana (All years)." Published: 11/22/2011. http://pest.ceris.purdue.edu/map.php?code=ITBUDUA&year=alltime. Accessed: 11/22/2011.

Table 2. Disease and virus results.

CAPS Survey of Small Grains, 2011

Survey #	Crop	WSMV	HPV	TriMV	BYDV	CYDV	Other diseases*	Notes
SG13JUN11MSU001	not wheat	nt**	nt	nt	nt	nt		
SG13JUN11MSU002	not wheat	nt	nt	nt	nt	nt		
SG13JUN11MSU003	not wheat	nt	nt	nt	nt	nt		
SG13JUN11MSU004	not wheat	nt	nt	nt	nt	nt		
SG14JUN11MSU005	wheat	nt	nt	nt	nt	nt		Hail
SG14JUN11MSU006	may not be wheat	neg	nt	nt	nt	nt		
SG14JUN11MSU007	may not be wheat	nt	nt	nt	nt	nt		
SG14JUN11MSU008	wheat	neg	nt	nt	nt	nt		N deficiency
SG14JUN11MSU009	wheat	nt	nt	nt	nt	nt	tan spot	
SG15JUN11MSU010	wheat	nt	nt	nt	nt	nt		Bad sample
SG15JUN11MSU011	wheat	nt	nt	nt	nt	nt	tan spot	
SG15JUN11MSU012	may not be wheat	nt	nt	nt	nt	nt	tan spot	
SG15JUN11MSU013	wheat	neg	nt	nt	nt	nt	tan spot	
SG15JUN11MSU014	wheat	neg	nt	nt	nt	nt	tan spot	
SG16JUN11MSU015	not wheat	nt	nt	nt	nt	nt		
SG16JUN11MSU016	wheat	nt	nt	nt	nt	nt		Cold, wet
SG16JUN11MSU017	barley	nt	nt	nt	nt	nt	spot form NB	
SG16JUN11MSU018	wheat	nt	nt	nt	nt	nt		
SG16JUN11MSU019	wheat	nt	nt	nt	nt	nt		Cold wet soil
SG16JUN11MSU020	may not be wheat	nt	nt	nt	nt	nt		
SG17JUN11MSU021	wheat	nt	nt	nt	nt	nt	tan spot	
SG17JUN11MSU022	wheat	nt	nt	nt	nt	nt	tan spot	
SG17JUN11MSU023	wheat	nt	nt	nt	nt	nt	tan spot	
SG17JUN11MSU024	wheat	nt	nt	nt	nt	nt	tan spot	
SG17JUN11MSU025	wheat	nt	nt	nt	nt	nt	tan spot	
SG25JUL11MSU026	wheat	nt	nt	nt	nt	nt	sharp eyespot	
SG26JUL11MSU027	wheat	nt	nt	nt	nt	nt	Common Root Rot	
SG26JUL11MSU028	wheat	nt	nt	nt	nt	nt	stripe rust	
SG26JUL11MSU029	wheat	nt	nt	nt	nt	nt	Eng Grain Aphid	
SG26JUL11MSU030	wheat	nt	nt	nt	nt	nt	FCR	
SG26JUL11MSU031	wheat	nt	nt	nt	nt	nt	FCR	
SG27JUL11MSU032	wheat	nt	nt	nt	nt	nt	None	
SG27JUL11MSU033	wheat	nt	nt	nt	nt	nt	Sept & Glume Blotch	
SG27JUL11MSU034	wheat	nt	nt	nt	nt	nt	Sept/Stripe Rust	Hail
SG27JUL11MSU035	wheat	nt	nt	nt	nt	nt	Wheat stem Maggot	
SG27JUL11MSU036	wheat	nt	nt	nt	nt	nt	Tan spot	
SG27JUL11MSU037	wheat	nt	nt	nt	nt	nt	Tan spot	
SG27JUL11MSU038	wheat	nt	nt	nt	nt	nt	Tan spot	Hail
SG27JUL11MSU039	wheat	nt	nt	nt	nt	nt	FCR/Tan Spot	
SG27JUL11MSU040	wheat	nt	nt	nt	nt	nt	Septoria Leaf Spot	
SG28JUL11MSU041	wheat	nt	nt	nt	nt	nt	Stripe Rust	
SG28JUL11MSU042	wheat	nt	nt	nt	nt	nt	FCR/Stripe Rust	
SG28JUL11MSU043	wheat	nt	nt	nt	nt	nt	Melanism/FCR	
SG28JUL11MSU044	wheat	nt	nt	nt	nt	nt	Thrips dmg/Cured Tan spot or Sept	
SG28JUL11MSU045	wheat	nt	nt	nt	nt	nt	Tan spot	
SG28JUL11MSU046	wheat	nt	nt	nt	nt	nt	sharp eyespot	
SG29JUL11MSU047	barley	nt	nt	nt	nt	nt	scald	
SG29JUL11MSU048	barley	nt	nt	nt	nt	nt	spot form NB/thrips	
SG29JUL11MSU049	wheat	nt	nt	nt	nt	nt		Healthy
SG29JUL11MSU050	wheat	nt	nt	nt	nt	nt	Cured Stripe rust and active	

*Other diseasesdonr by visual evaluation
**nt = not tested. All samples were visually evaluated and test only if there were virus symptoms.

Shelter Belt Health Assessment Survey

Detection Survey

While most people envision Montana as a land of mountains, rivers, and vast skies, there are large portions of the state where a prairie, or even high desert environment, prevail. As these areas were homesteaded, and again in the 1930's and 1940's, shelterbelts of assorted tree species were planted in attempts to keep the wind from blowing all of the topsoil away. In some areas, up to 3 inches of soil can be lost in a summer if there is no protection from the wind. Now, many of the trees in these shelterbelts are approaching a time of life when they are particularly susceptible to pests, such as insects and diseases. While there is scattered knowledge of outbreaks of various pests, such as white satin moth, overall, the factors influencing shelterbelts are little known. Shelterbelts were commonly composed of several species, some of which are now considered problems, such as common barberry and Russian olive.

There is currently an increasing need to assess the age structure, health, and composition of the shelterbelts across the state. This need is greatest in some specific areas - the northern tier of counties commonly known as the Hi-line (Daniels, Sheridan, Roosevelt, Valley, Phillips, Blaine, Hill, Liberty and Toole), and a number of counties in south-central Montana (Fergus, Judith Basin, Wheatland, Golden Valley, Big Horn, Treasure, Rosebud, Musselshell and Petroleum). Many of these counties have been through multiple years of drought recently, which has created a major stresses on those trees and shrubs, even though many were chosen for their ability to withstand dry conditions. Outbreaks of native pest species have ravaged the shelterbelts where large numbers of native trees, for example Ponderosa pine and mountain pine beetle, were used. In shelterbelts where non-native species were used, generalist pests and exotic pests are damaging the trees to the extent that they cannot survive. In addition, in some areas, plants were used that are now known to create problems. In some cases, these problems are site-specific - the plant may be a problem in one area, but not another. In other cases, such as barberry, certain species and varieties create an unacceptable disease risk regardless of the site.

Ignoring these islands of habitat throughout the Great Plains, including Montana, could allow invasive species to not only establish, but also to move from island to island across the ocean of prairie, removing not only the shelterbelts, but moving into new urban and suburban areas as well.

The survey portion of this project was completed in coordination with Montana State University Entomology and Extension. Traps were placed at 25 shelter belt sites for exotic moths and wood boring beetles, sweep net samples were collected for the general entomofauna, and whole plant samples were collected for plant disease and virus samples. General site conditions were also observed and recorded about the shelter belt including the orientation

and direction, age, species composition, design, general health, and any current management practices.

Results

Surveyed shelter belts were composed of a relatively diverse plant assemblage including pine, spruce, caragana, lilac, juniper, Russian olive, willow, cottonwood, box elder, and green ash. The most commonly recorded species was caragana which was documented in nearly 75% of surveyed shelter belt locations. Green ash was not as dominant in sample locations as had been expected, green ash appears to be more dominant in urban areas and the riparian areas of far Eastern Montana, but may not be as widely used in shelter belts as it has been in urban areas.

No target or reportable diseases or viruses were detected in samples. Plant pathogens detected included juniper-hawthorn rust, ash anthracnose, mildews, and service berry rust.

Exotic moth traps were placed at 25 locations for *Dendrolimus sibiricus*, *D. pini*, *D. superans*, *Rhyacionia buoliana*, and *Thaumatotibia leucotreta*. All traps were negative for target species. Some traps are pending final identification by the Washington State Department of Agriculture regional Lepidoptera screening lab.

Lindgren funnel traps were placed at 74 locations with either Sirex, α-pinene, ethanol, or Scolytus lure. All traps were negative for target species. The Siricidae species recorded from Montana are listed below.

Siricidae Species Recorded from Montana

Sirex cyaneus Fabricius
Sirex juvencus californicus (Ashmead)
Sirex longicauda Middlekauff
Sirex varipes Walker
Tremex columba (Linnaeus)
Urocerus albicornis (Fabricius)
Urocerus californicus Norton
Urocerus cressoni Norton
Urocerus gigas flavicornis (Fabricius)
Xeris morrisoni indecisus (MacGillivray)
Xeris spectrum (Linnaeus)

Xeris spectrum (L.) (right). Images from Guide to the Siricid Woodwasps of North America, Nathan M. Schiff, Steven A. Valley, James R. LaBonte, and David R. Smith.

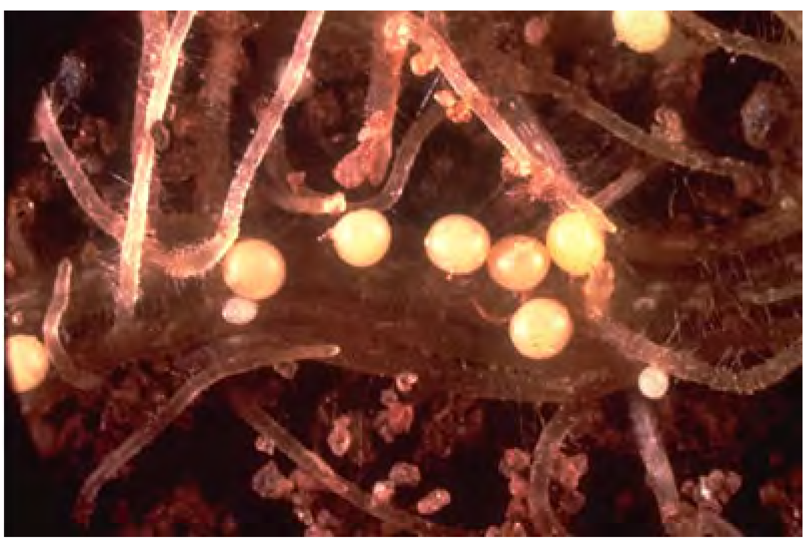
Potato Cyst Nematodes
Globodera pallida (Stone) & *G. rostochiensis* (Wollenweber)
Detection Survey

INTRODUCTION

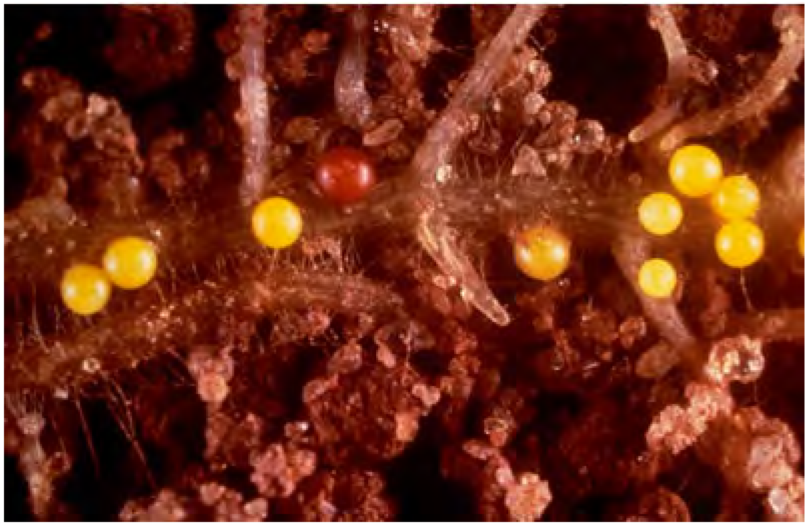
Montana is a supplier of seed potatoes for much of the Pacific Northwest. Because of this, it is imperative that the quality of Montana's potatoes, and their reputation, be maintained. In 2006, *Globodera pallida* was found in Idaho, in commercial potato fields. In the aftermath of this find, several trading partners closed their doors not only to Idaho potatoes but also to other crops including nursery stock. In addition, farms in the "infested area" are undergoing treatments to eliminate the nematodes and operate under restrictions that create new challenges. If this organism were discovered on seed potatoes from Montana, there is a real possibility that it would destroy the seed potato industry. The Montana potato industry plants over 10,000 acres annually with crops valued at over $30 million.

Shortly after the Idaho find, producers in Alberta (Canada) found golden cyst nematode (*Globodera rostochiensis*) in fields. This initiated international action again, with subsequent trace-forward action involving a Montana field.

The presence of either of these organisms in Montana would have devastating impacts on the seed potato industry. Action can be taken now to 1) systematically determine if these pests have invaded Montana and, 2) shield the potato industry by creating an internal quarantine system, so that if potato cyst nematodes were found in any area of the state, the remaining production areas could continue to ship.



***Globodera pallida* cysts, www.eppo.org/**



Globodera rostochiensis **cysts, www.eppo.org/**

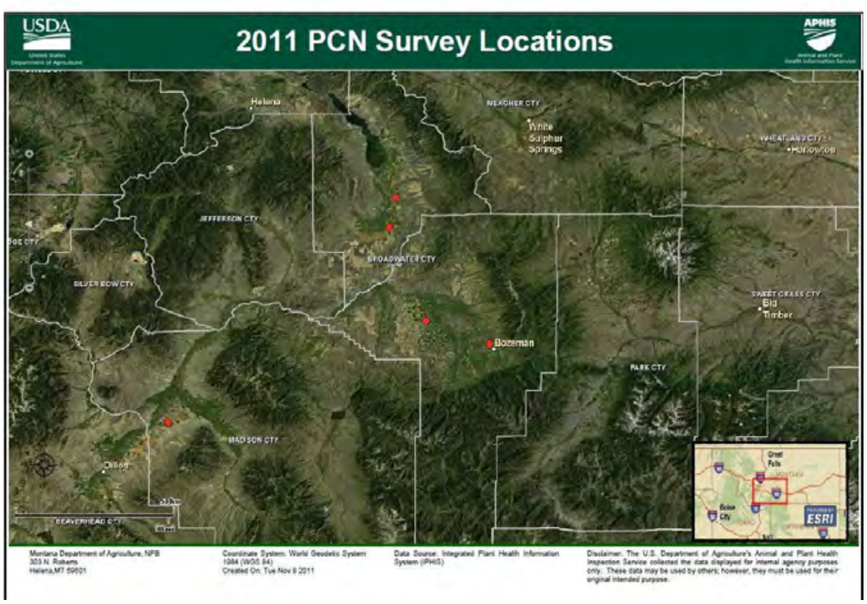
PLAN OF ACTION

A statewide survey of seed potato producers was developed to adequately represent and sample potato production areas. Surveys in 2011 were conducted in several counties with potato crops identified as economically important to Montana's export markets. The counties sampled in 2011 were Broadwater, Gallatin, and Madison.

Samples were collected using USDA protocols. Each sample consisted of five pounds of soil per acre of crop in field that were just harvested from potatoes. Data collected included date of collection, collector, potato variety, seed generation, and field number.

RESULTS

Three grower operations were sampled for a total of 148 acres sampled. Sample processing is ongoing, but so far, no positive samples have been found.



Riparian Area Invaders

Bundled Detection Survey

To say Montana's aquatic resources, and their surrounding lands, are important, is an understatement almost as vast as the Montana sky. The state contains the headwaters of not only the Missouri River, but also of the Columbia River, and the Red River of the North. At Triple Divide Peak in northwestern Montana, water moves to all three of these watersheds from a single mountain. These rivers, and the riparian areas around them, are, in Montana, mostly minimally impacted by human activity. However, recent discoveries of new aquatic and semi-aquatic pests and weeds have brought home the fact that size and a dispersed population are not a protection against invasion by these enemies of agriculture. The rivers, their water, and their surroundings, have to be considered a commodity. In past years, it has been said that in the west, whiskey is for drinking and water is for fighting over. At this point, we are at the beginning of a war that may still be winnable, fighting the enemies selected for this survey, and others that may be incidentally found as a result of the survey. This group of invaders includes mollusks, terrestrial weeds, and aquatic weeds. New species of all of these groups are found almost every year in Montana, which is both disheartening, and challenging. The state is very large, and significant survey has not been possible at the present time.

Weeds were sight-identified in the field, and through specimen collection of plants that could not be field identified. Among the weeds targeted for special attention are horse thistle (*Onopordum acaulus*), yellow star thistle (*Centaurea solstitialis*), dyer's woad (*Isatis tinctoria*), rush skeleton weed, (*Chondrilla juncea*), purple loosestrife (*Lythrum salicaria*), scotchbroom (*Cytisus scoparius*), Eurasian water milfoil (*Myriopyllum spicatum*), salt cedar (*Tamarix* spp.), and hydrilla (*Hydrilla verticillata*. Other Montana noxious weeds surveyed for include: flowering rush (*Butomus umbellatus*), tansy ragwort (*Senecio jacobaea*), orange hawkweed (*Hieracium aurantiacum*), members of the yellow hawkweed complex (other *Hieracium* spp.), tall buttercup (*Ranunculus acris*), yellow flag iris (*Iris pseudacorus*), blueweed (*Echium vulgare*), perennial pepperweed (*Lepidum*), and hoary alyssum (*Berteroa incana*).

Yellow Flag Iris, a State Noxious Weed, in Ravalli County.

Protecting Montana aquatic resources, which are used not only by traditional agriculture throughout Montana (and downstream states), but also for recreation and wildlife is vital to the health of the state. Replacement of native resources with invasive species can start a cascading effect through the ecosystem.

RESULTS: Surveys were conducted at 87 sites primarily west of the Continental Divide, but also including locations on the Yellowstone and Missouri Rivers. Weeds that were detected included Canada thistle, cheatgrass, yellow flag iris, flowering rush, dalmatian toadflax, field bindweed, leafy spurge, oxeye daisy, perennial pepperweed, spotted knapweed, and sulfur cinquefoil. No target mollusk or federal noxious weed species were detected.

Flowering Rush in Flathead County.

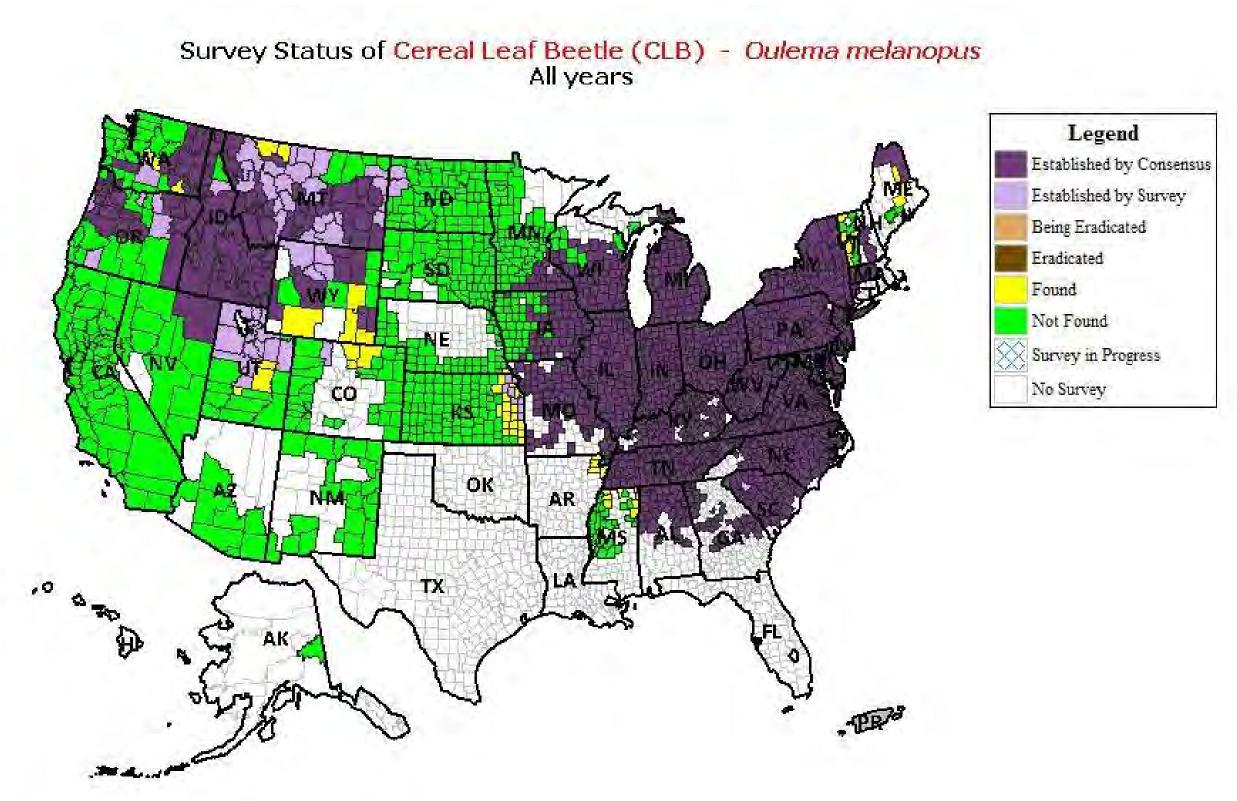
Cereal Leaf Beetle Detection Survey
Oulema melanopus (L.)

Cereal leaf beetle (CLB), pictured below, is an exotic quarantine pest of forage and cereal grains. It is commonly found on small grains, particularly wheat, barley, and oats. The adults and immatures feed on developing plants, at times causing extreme defoliation.

Adult cereal leaf beetle. Approximate length 1/8 to 1/4 inch long.

Sweep net samples were taken during the survey and samples were screened specifically for CLB adults and larvae. Whole plants were also collected to check for the presence of eggs and larval feeding damage.

Seventy-three (73) sweep samples were taken in 2011 focusing on the reported uninfested counties. In total, 52 of Montana's 56 counties have had CLB detections since the discovery of the pest in the late 1980's. In 2011, cereal leaf beetle was detected for the first time in Hill County, the counties that remain free of CLB based on official survey are: Phillips, Valley, Daniels, and Sheridan. The cereal leaf beetle survey will be discontinued in 2012 from the CAPS survey effort. The uninfested counties may be surveyed by Montana State University Extension with updated results reported by MDA to the NAPIS and IPHIS databases.



National Agricultural Pest Information System (NAPIS). Purdue University. "Survey Status of Cereal Leaf Beetle (CLB) - Oulema melanopus (All years)." Published: 11/15/2011. http://pest.ceris.purdue.edu/map.php?code=INAMCMA&year=alltime. Accessed: 11/21/2011.

Status Report
Japanese Beetle (*Popillia japonica* Newmann)

Billings, Montana 2011

Japanese beetles (JB) were discovered in Billings in 2001 near the Logan International Airport and spread into the city of Billings over the following years. Early delimitation surveys found that the JB were in the neighborhoods below the Rimrocks, a series of dry sandstone cliffs immediately south of the airport. Thus far JB have only been found in an area within a one mile radius of the campus of Montana State University – Billings, near the intersection of Montana State Highway 3 and Rimrock Road. In 2008 an official regulated area was established to prevent the spread of infested material out of this area. The regulated area includes over 650 properties including many private homes and a few large landowners including MSU-B and Rocky Mountain College, the airport and other land managed by the City of Billings. Details of the State of Montana interior quarantine can be found here:
http://agr.mt.gov/weedpest/pdf/quarantineJBeetle.pdf

In 2011, a limited number of traps were placed in areas that were found to have JB in previous years in Yellowstone County. Plastic JB traps baited with a floral scent and female sex pheromones were used to survey for JB adults (Figure 1).

Figure 1. Japanese beetle trap placed below Virginia creeper vines on the Leavens Pumping Station fence. This trap yielded more than 400 adult JB in 2009. The fence encloses a large area of well irrigated turf grass, some of which appears to be damaged by wild turkeys foraging for JB larvae.

RESULTS: 253 traps were placed statewide. Forty-three (43) adults were trapped in Yellowstone County within the regulated area and seven (7) adults were trapped at a nursery in Flathead County. In 2012, additional trapping efforts will be focused on the Flathead County location. Japanese beetle was previously detected in Lake County in 2008 and Flathead County in 2009; in both instances subsequent trapping in those areas was negative. It is assumed that Japanese beetle adults are being moved into this area on regulated articles including nursery stock.

Japanese Beetle Trapping, **USDA APHIS PPQ**, **MONTANA AIRPORTS 2011**

The USDA APHIS PPQ traps for Japanese beetles at selected high risk airports within the state. Based on airport size, and number of flights from infested areas, traps are placed around the perimeter of the airports, and in any landscaping that might increase risk of JB infestation.

During 2011, the USDA APHIS PPQ placed and monitored 32 traps at six airports. These were Bozeman (5 traps), Butte (5 traps), Great Falls (5 traps), Helena (5 traps), Missoula (6 traps), and Kalispell (6 traps).

There were no detections of JB during the 2011 season in traps monitored by the USDA APHIS PPQ.

2011-2012 Plum Pox Virus Survey
National Detection Survey

Plum pox virus (PPV) is a devastating disease of stone fruit tree species such as cherries, peaches, and plums. PPV can be spread throughout live nursery stock in grafts and budwood of infected plants. It is transmitted from one plant to another by the feeding of several species of aphid.

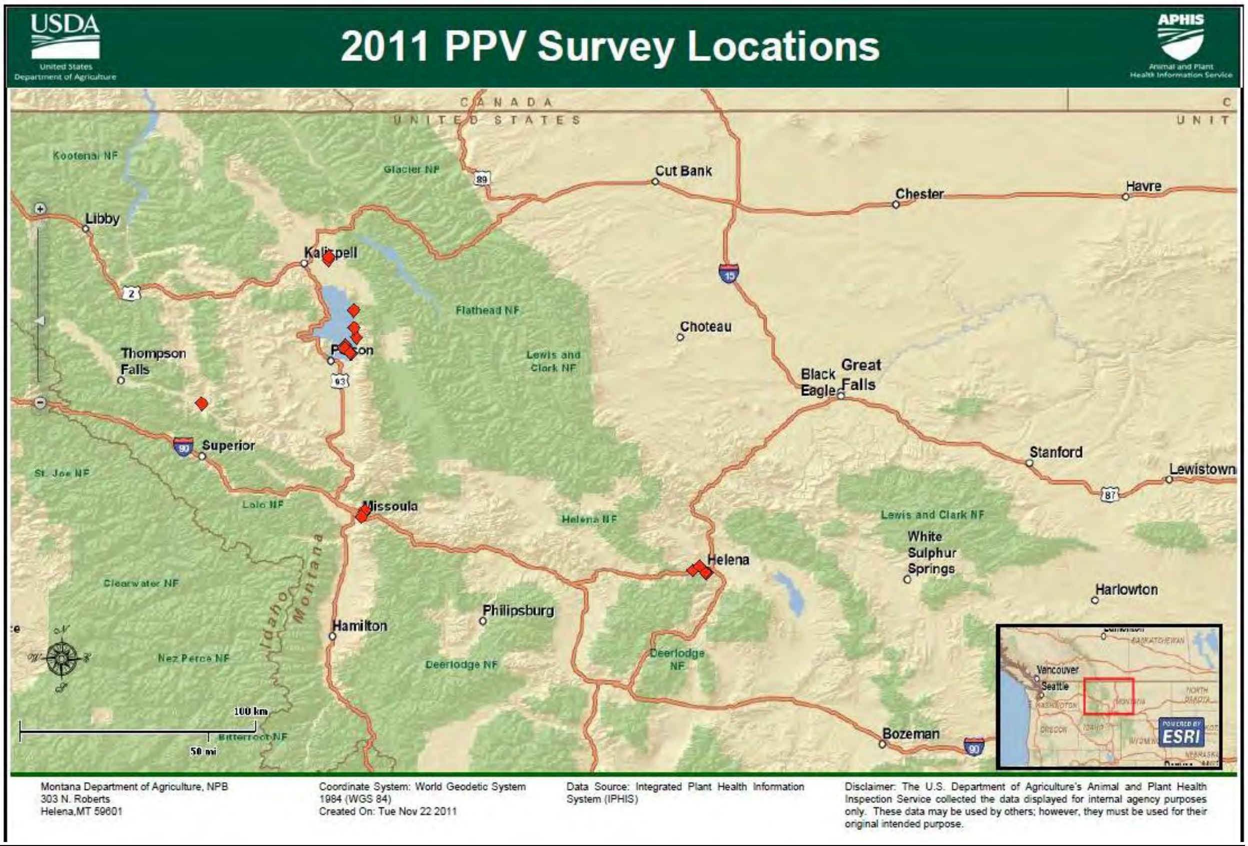
PPV poses a special threat in Montana due to the cherry industry around Flathead Lake. Many nurseries in the area also produce various types of ornamental *Prunus.* There are native populations of *Prunus virginiana,* or Chokecherry, throughout the state that are susceptible to PPV.

Sampling is done in the early summer months because as temperatures increase the PPV virus in infected trees is harder to detect. Samples are collected from throughout the tree canopy and are immediately sent to the diagnostic lab for testing.

During the survey in 2011, 246 *Prunus* samples were collected from 5 counties. The samples were tested by personnel at the Schutter Diagnostic Laboratory at Montana State University using the ELISA method. All samples were found negative for all strains of PPV. Additional samples will be collected in 2012.

County	Number of Samples
Flathead	186
Lake	8
Lewis & Clark	5
Missoula	4
Sanders	43
TOTAL	**246**

Plum pox potyvirus: spots on apricot stones (left).


USDA
APHIS
2011 PPV Survey Locations
CANADA
UNITED STATES
Kootenai NF
Glacier NF
Cut Bank
Chester
Havre
Libby
Kalispell
Flathead NF
Choteau
Thompson Falls
Polson
Lewis and Clark NF
Black Eagle
Great Falls
Superior
St. Joe NF
Lolo NF
Missoula
Helena NF
Stanford
Lewistown
Lewis and Clark NF
White Sulphur Springs
Helena
Harlowton
Clearwater NF
Montana
Idaho
Hamilton
Philipsburg
Nez Perce NF
Deerlodge NF
Deerlodge NF
Bitterroot NF
100 km
50 mi
Bozeman
Vancouver
Seattle
ESRI
Montana Department of Agriculture, NPB
303 N. Roberts
Helena,MT 59601
Coordinate System: World Geodetic System 1984 (WGS 84)
Created On: Tue Nov 22 2011
Data Source: Integrated Plant Health Information System (IPHIS)
Disclaimer: The U.S. Department of Agriculture's Animal and Plant Health Inspection Service collected the data displayed for internal agency purposes only. These data may be used by others; however, they must be used for their original intended purpose.

2011-2012 National Honey Bee Survey

National Detection Survey

Montana has a substantial beekeeping industry and thus was one of the participating states in the 2007 pilot program of this survey. (The other was Florida, which also has a large beekeeping industry and, like Montana, statutory authority and an established bee-inspection program.)

In an average year Montana has about 150,000 to 160,000 beehives, of which the majority are migratory. Montana has about 150 registered beekeepers, about half of whom are commercial operators. Most of these provide commercial pollination services outside Montana. Migratory beekeepers typically travel to California in the early spring for almond pollination, then move to fruit crops in Washington and Oregon before moving back to Montana for the summer. Ranked by revenue, beekeeping is the 10th largest agricultural industry in Montana; pollination fees make up the majority of that income.

Pests of honey bees are a serious threat to the agricultural economy of Montana as well as to the states where Montana-based bees provide pollination. USDA estimates that honey bee pollination adds some $15 billion to the value of American agriculture. In 2006 beekeepers began reporting unexplained and unexpected losses of 30% or more of their hives. What eventually came to be called "Colony Collapse Disorder" was characterized by the rapid disappearance of worker bees from apparently healthy hives. Despite a considerable increase in honey bee research, the cause of colony collapse remains unknown, and unexplained losses continue at about 30% per year.

Montana bee yard.

A healthy frame of brood.

In 2009 the USDA-APHIS initiated the National Honey Bee Pests and Diseases Survey in all 50 states. The primary objectives of the survey are to confirm the absence of tropical bee mites in the genus *Tropilaelaps*, the absence of the Asian honey bee *Apis ceranae*, and the absence of Slow Paralysis Virus, a honey bee disease associated with *A. ceranae*. Secondary objectives include evaluating the overall health of the apiaries sampled to establish a baseline for future research. Samples submitted from the survey will be evaluated for their mite loads (*Varroa,* tracheal mites, and other parasitic mites) and the degree to which viruses and other pathogens

are present (particularly *Nosema ceranae*, a more virulent *Nosema* species associated with tropical honey bees). Viruses will be identified at the molecular level by the USDA "bee lab" in Beltsville, MD.

Varroa mites on a drone pupa.

RESULTS: We collected 10 of the 25 samples assigned to Montana before the weather cooled to the point that further collecting was not possible. We anticipate being able to resume collecting samples by late May, and to have all samples sent to the USDA lab in Beltsville, MD by the end of the funding period.

Robert Wiltzen

Montana Department of Agriculture

Internship Paper

Summer 2011

This summer I once again had the opportunity to work as an intern for the state of Montana in the Pest Management Bureau. The work consisted of surveying for gypsy moths, cereal leaf beetles and invasive weeds all throughout Montana. I was also lucky to be part of the Incident Command System (ICS) training workshop.

The primary work I did this summer dealt with the surveying for gypsy moths in Montana northwest of the continental divide. To survey for these moths I constructed 266 sticky triangular traps and placed them near large bodies of water such as lakes or nearby rivers. Upon setting a trap I would place a pheromone lure inside the trap as bait. Every two weeks I would travel back to add new lure.

Gypsy moths originated from Eurasia and were accidentally introduced to North America in the late 1860's when a French scientist wanted to hybridize the native silk caterpillars to be resistant to diseases. Before he could genetically cross these two species some of the moths escaped from his lab. The gypsy moth is now one of the most destructive pests of hardwood trees in the eastern United States; it and other foliage-eating pests cause an estimated $868 million in annual damages in the U.S. To control the Gypsy moth outbreak in 1906 a large metallic green beetle known as *Calosoma sycophanta* was introduced into New England from Europe. It is now established throughout Pennsylvania. *C. sycophanta* larvae and adults help reduce outbreaks by eating older gypsy moth caterpillars that rest in the leaf litter during the daytime.

Currently these moths have still been spreading west in the U.S. because of the sale of firewood that is imported from other GM infected states. A common outbreak site of GM's is campgrounds because the firewood which contains their eggs are easily transported from state to state during summer vacationing. A few years ago there was one confirmed case of gypsy moths near Lake Koocanusa in Libby, but since then the moths have been off the grid in this state.

To prevent this destructive moth from spreading further west commercial firewood has started to be inspected prior to sale. Education outreach is probably the most effective way to combat the gypsy moth. Also, if camp hosts can make travelers aware of the possible damages these moths do to the agriculture and tourism industry only then will prevention through awareness become the cheapest and most effective way to control these moths.

Another pest I surveyed for is the Cereal Leaf Beetle. It is an invasive beetle which like the Gypsy moth also originates from Eurasia. This beetle has become problematic to Montana

farmers. Since this type of beetle feeds on the leaves of barley, oat, and wheat plants, the result is a significant decrease in annual crops. To combat the Cereal Leaf Beetle, an introduced wasp parasitizes the beetle larva by laying eggs inside its host. The wasp eggs then develop into larva and slowly devour the host beetle.

To search for CLB's I traveled mostly east of the continental divide and inspected grain fields with a bug net. If I found any larvae I would put them in a container and bring them back to the lab. At the lab they would get dissected to see how prevalent the parasitized larva was and if the method of biocontrol was effective.

In the middle of summer I was fortunate to assist another intern on her work. Her work included surveying for invasive weeds in riparian areas all over Montana. The data collected from her surveying is important because it will be used to compare historical surveys to the present and show how plants densities have changed. Upon surveying a site we would document all the plant species by taking pictures and writing on paper. Also when we worked together I would collect any interesting invertebrates to bring back to the lab for identifying. If the site matched suitable habitat for GM's and CLB's I would then survey for them in the nearby areas.

Toward the end of the summer I was integrated in an ICS (incident command system) workshop. The purpose of the workshop is a fundamental exercise that trains different organizations to work together that normally would not during catastrophic events. The ability to make fast decisions between multiple commands and to communicate effectively is very valued in stressful environments. The exercise I was involved with was a two day event called Operation Crop Rescue 2011. The event portrayed a fictional quarantine of Bozeman due to an invasive crop leafhopper that threatened the area. Each day during the exercise we were briefed in the morning and evening so everyone was current with news. Teams were broken up to manage all the major necessities during the exercise. These included a communications team, two field teams and other various logistical and decision based teams. In the end of the exercise working with other agencies effectively and safely was the important take home message. During this summer flooding and oil spills were happening throughout eastern Montana and the same ICS's were used at the sites. I however was not at the other ICS's going on. They were real life not fictional and they lasted months not two days. I could only imagine how stressful that would be.

In retrospect of the work I did this summer I was glad to be a part of making the state better while also working with some cool cats. Exploring parts of my home state I had never been to was definitely a perk of this internship as well as working independently in the field. The job as a whole was a rewarding experience and what I learned was invaluable. Thanks to everyone that had a part in this journey.